DISCUSSION OF THE AMENDMENTS

Claims 1-4 were previously cancelled.

Claims 5 and 7-10 were previously presented.

Claim 6 is currently amended.

Upon entry of the amendment, claims 5-10 will be active.

The amendment to claim 6 is supported by claim 5 as previously presented.

No new matter has been added.

REMARKS

The Office rejected claims 5-7 and 9 under 35 U.S.C. §103(a) over the combination of Adams (U.S. Patent No. 3,161,670) and Gussow (U.S. Patent No. 4,558,168). In addition, the Office rejected claims 8 and 10 under 35 U.S.C. §103(a) over the combination of Adams, Gussow and Boelt (U.S. Publication No. 2003/0220530). Finally, the Office provisionally rejected claims 5-10 on the ground of nonstatutory obviousness-type double patenting over claims 6-11 of Application No. 10/584,758. Applicants submit that the combination of cited references do not teach or suggest all the recitations of the claimed process, and therefore, the claimed process would not have been rendered unpatentable under 35 U.S.C. §103(a).

The disclosed process involves:

A) providing a feed gas stream a comprising n-butane;

B) feeding the feed gas stream a comprising n-butane into at least one first dehydrogenation zone and nonoxidatively catalytically dehydrogenating n-butane to obtain a product gas stream b comprising n-butane, 1-butene, 2-butene, butadiene, hydrogen, low-boiling secondary constituents and in some cases steam;

C) feeding the product gas stream b of the nonoxidative catalytic dehydrogenation and an oxygenous gas into at least one second dehydrogenation zone and oxidatively dehydrogenating n-butane, 1-butene and 2-butene to obtain a product gas stream c comprising n-butane, 2-butene, butadiene, low-boiling secondary constituents and steam, said product gas stream c having a higher content of butadiene than the product gas stream b;

D) removing the low-boiling secondary constituents and steam to obtain a C_4 product gas stream d substantially consisting of n-butane, 2-butene and butadiene;

E) separating the C_4 product gas stream d into a stream e1 consisting substantially of n-butane and 2-butene and a product of value stream e2 consisting substantially of butadiene by extractive distillation;

F) feeding the stream e1 consisting substantially of n-butane and 2-butene and a cycle stream g comprising 1-butene and 2-butene into a distillation zone and separating into a 1-butene-rich product of value stream f1, a recycle stream f2 comprising 2-butene and n-butane and a stream f3 comprising 2-butene, and recycling the recycle stream f2 into the first dehydrogenation zone;

G) feeding the stream f3 comprising 2-butene into an isomerization zone and isomerizing 2-butene to 1-butene to obtain a cycle stream g comprising 1-butene and 2-butene, and recycling the cycle gas stream g into the distillation zone.

The rejection of claims 5-7 and 9 under 35 U.S.C. §103(a) over Adams and Gussow is respectfully traversed.

Adams describes a process for preparing olefinic compounds. In the process, a gas stream is first heated in a preheater then passed to a first dehydrogenation zone in the absence of oxygen followed by dehydrogenation in a second reaction zone in the presence of oxygen. The desired reaction product is isolated from unreacted gas and the unreacted gas is sent back to the first reaction zone. For butane, Adams isolates butadiene product and then sends unreacted butane and "butylenes" (i.e., 1-butene and 2-butene) back to the first reaction zone (see column 5, lines 36-38).

In contrast to Adams the disclosed process converts n-butane, 1-butene and 2-butene to obtain a product gas stream C containing n-butane, 2-butene and butadiene (step C)). From there the disclosed process conducts steps D), E) and F) which are not taught or suggested by Adams.

Gussow describes a process for producing 1-butene from butane. Applicants agree that Gussow describes the isomerzation of 2-butene to 1-butene which is recited in step G); however, Gussow does not make up for the deficiencies of Adams. Specifically, Gussow does not teach or suggest steps C) through F) as recited in claim 5. Accordingly, the combination of Adams and Gussow do not teach or suggest all the recitations of claims 5-7 and 9. Applicants note that in order to establish a prima facie case of obviousness, all the claim elements of the claimed subject

matter must be taught or suggested by the cited references. Because the combination of Adams and Gussow do not teach or suggest all the recitations of the claimed process, the claimed process would not have been obvious under 35 U.S.C. §103(a) over the combination of Adams and Gussow. Therefore, Applicants respectfully request that the Office withdraw the rejection of claims 5-7 and 9 under 35 U.S.C. §103(a) over Adams and Gussow.

With regard to claim 6, Applicants point out that Adams does not conduct the first nonoxidative dehydrogenation step autothermally. Adams preheats the gas rather than conducting an autothermal process. Applicants note that an autothermal process is achieved by obtaining heat from the reaction of added oxygen and hydrogen formed during dehydrogenation. Adams avoids this autothermal process whereas the claimed process utilizes it. Accordingly, the Adams process can not be autothermal, and therefore, this feature of the claimed process distinguishes claim 6 over Adams. Applicants note that non-oxidative dehydration reactions can be run with oxygen present. Therefore, in contrast to Adams, the first nonoxidative dehydrogenation step is run with oxygen present. The added oxygen reacts with generated hydrogen to form heat giving the autothermal process.

Further, the terms nonoxidative and oxidative refer to the dehydrogenation reactions not the hydrogen/oxygen reaction providing the autothermal heat. In nonoxidative dehydrogenation hydrogen gas is formed by elimination of the H_2 from the hydrocarbon. In oxidative dehydrogenation free hydrogen is not formed in substantial amounts. In oxidative dehydrogenation hydrogen atoms are removed from the hydrocarbon with oxygen. Since neither Adams or Gussow teaches an autothermal process, claim 6 would not have been obvious over Adams and Gussow.

Boelt describes a process for preparing olefins. However, Boelt does not make up for the deficiencies of Adams and Gussow. Therefore, claims 8 and 10 would not have been obvious over the combination of Adams, Gussow and Boelt. Accordingly, Applicants respectfully request that the Office withdraw the rejection of claims 8 and 10 under §103(a) over the combination of Adams, Gussow and Boelt.

Applicants request that the Office hold in abeyance the provisional rejection of claims 5-10 on the grounds of nonstatutory obviousness-type double patenting over claims 6-10 of U.S. Application No. 10/584,758. Applicants will address the claims of this application in due course.

Finally, Applicants note that the Abstract and claim 6 have been amended such that they are free of the criticisms on page 2 of the Office Action. Accordingly, Applicants respectfully request that the Office withdraw the objection to the Abstract and withdraw the rejection of claim 6 under 35 U.S.C. §112, second paragraph.

In view of the above remarks, Applicant believes the pending application is in condition for allowance. Favorable reconsideration is respectfully requested.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 13156-00060-US from which the undersigned is authorized to draw.

Dated: April 2, 2008

Respectfully submitted,
Electronic signature: /Donald K. Drummond, Ph.D./
Donald K. Drummond, Ph.D.
Registration No.: 52,834
CONNOLLY BOVE LODGE & HUTZ LLP
1875 Eye Street, NW
Suite 1100
Washington, DC 20006
(202) 331-7111
(202) 293-6229 (Fax)
Attorney for Applicant